The DOD Space Test Program and University Satellite Projects: Launch Opportunities

NASA National University Satellite Programs Workshop

Lt. Col. Perry Ballard

(505) 846-8812

perry.ballard@kirtland.af.mil

Agenda

- **STP Overview**
- **Current Missions**
- **Future Activities**
- **AFSPC Secondaries Policy**
- **Prospects**

Technology Transition: How it is supposed to work

Technology customer is the Acquisition Community
Acquisition customer is the User Community

Information flows between all groups,
but supplier relationships must never be violated

Without commercial companies technology never gets used!!!

"Catch 22" for Technology Transition

"You can't fly in space until you have flown in space"

– No one will use a new technology until it has been successfully demonstrated

– STP is only long term program specifically for that purpose

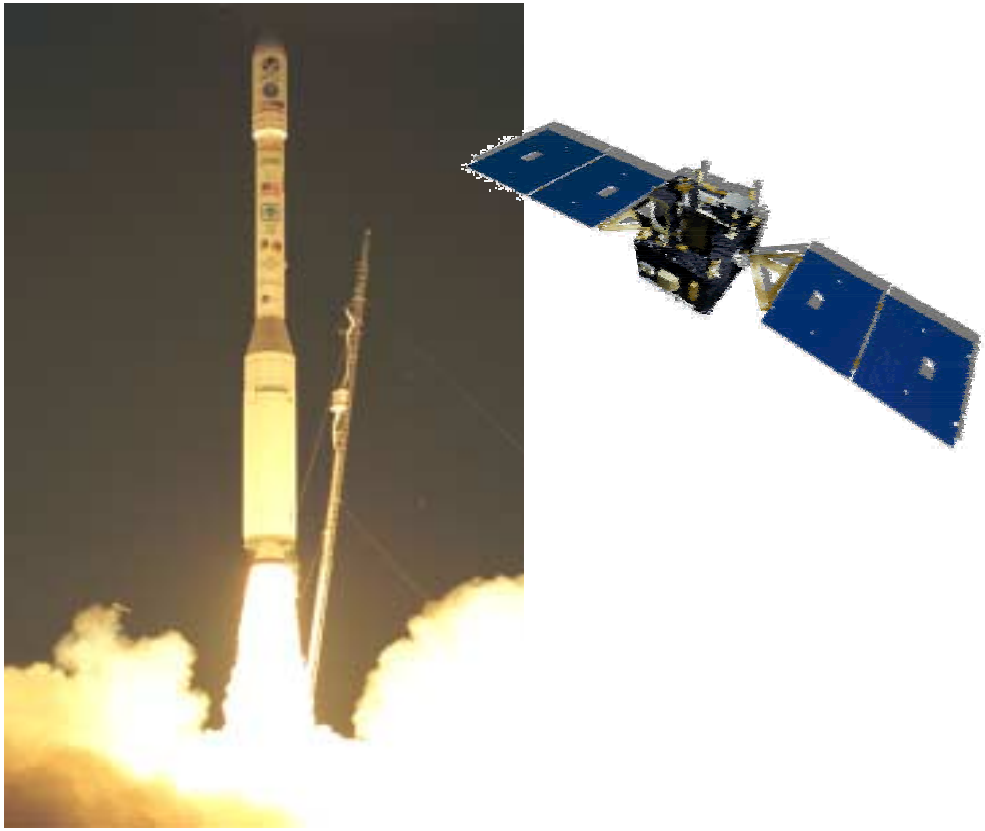
- Chartered in 1965, re-validated in 1995

Getting Technology to Space for the Warfighter

Space Test Program (STP)

Provides spaceflight for qualified DOD sponsored experiments at no charge to the experimenter or provides services on a reimbursable basis.

- Studies
- Spacecraft Acquisition
- Experiment Integration
- Launch Service
- Space Shuttle and ISS Payloads



Getting Technology to Space for the Warfighter

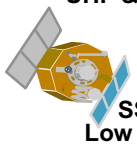
Space Test Program Legacy

Every operational DOD space system originated as an STP experiment - STP is the future of DOD Space

Communications

LES 6 (P67-2)
UHF

LES 8/9 (P74-1)
UHF & EHF

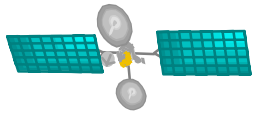


SSD-988 (P72-1)
Low Altitude Particles

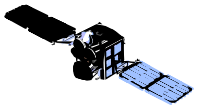
OGS (P87-2, S81-1)

FLTSATCOM

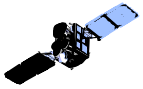
LEASAT



MILSTAR



DSCS-III

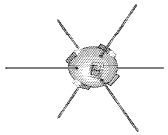


TDRS

Navigation

NTS-1 (P73-3)
Cs Atomic Cclocks

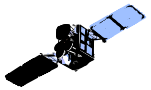
NTS-2 (P76-4)
Cs & Rb
Atomic Clocks
Full GPS Capability



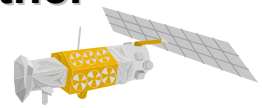
SCATHA
(P78-2)
Satellite
Charging

GPS

Surveillance and Weather



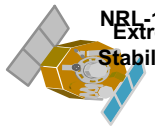
Polar Bear
(P87-1)



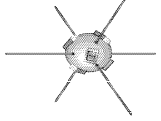
DMSP

RM15 (S67-3)
Spectral
Filters

DSP



NRL-114 and ML-101 (S72-1)
Extreme UV Radiation and
Stability of Thermal Materials

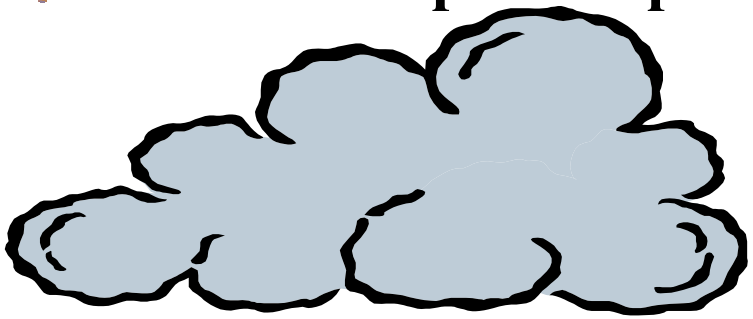


SCATHA
(P78-2)
Spacecraft
Charging

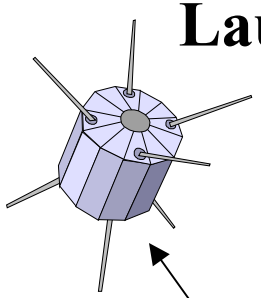
Getting Technology to Space for the Warfighter

Experiment Manifest Process

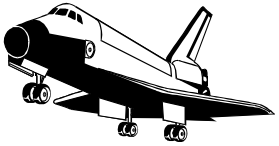
All DoD Space Experiments



Launch



Shuttle/ISS Flight

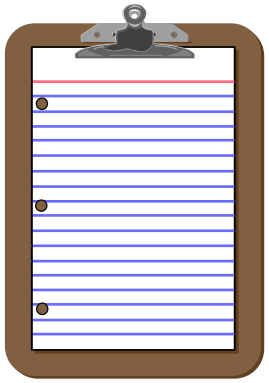


Contract Award

Spaceflight Plan

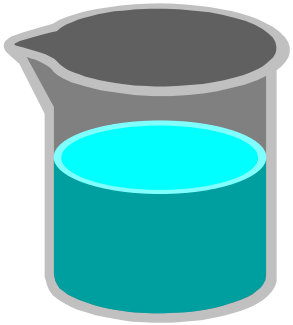
Service SERBs
(AF, Navy, BMDO…)

SERB List

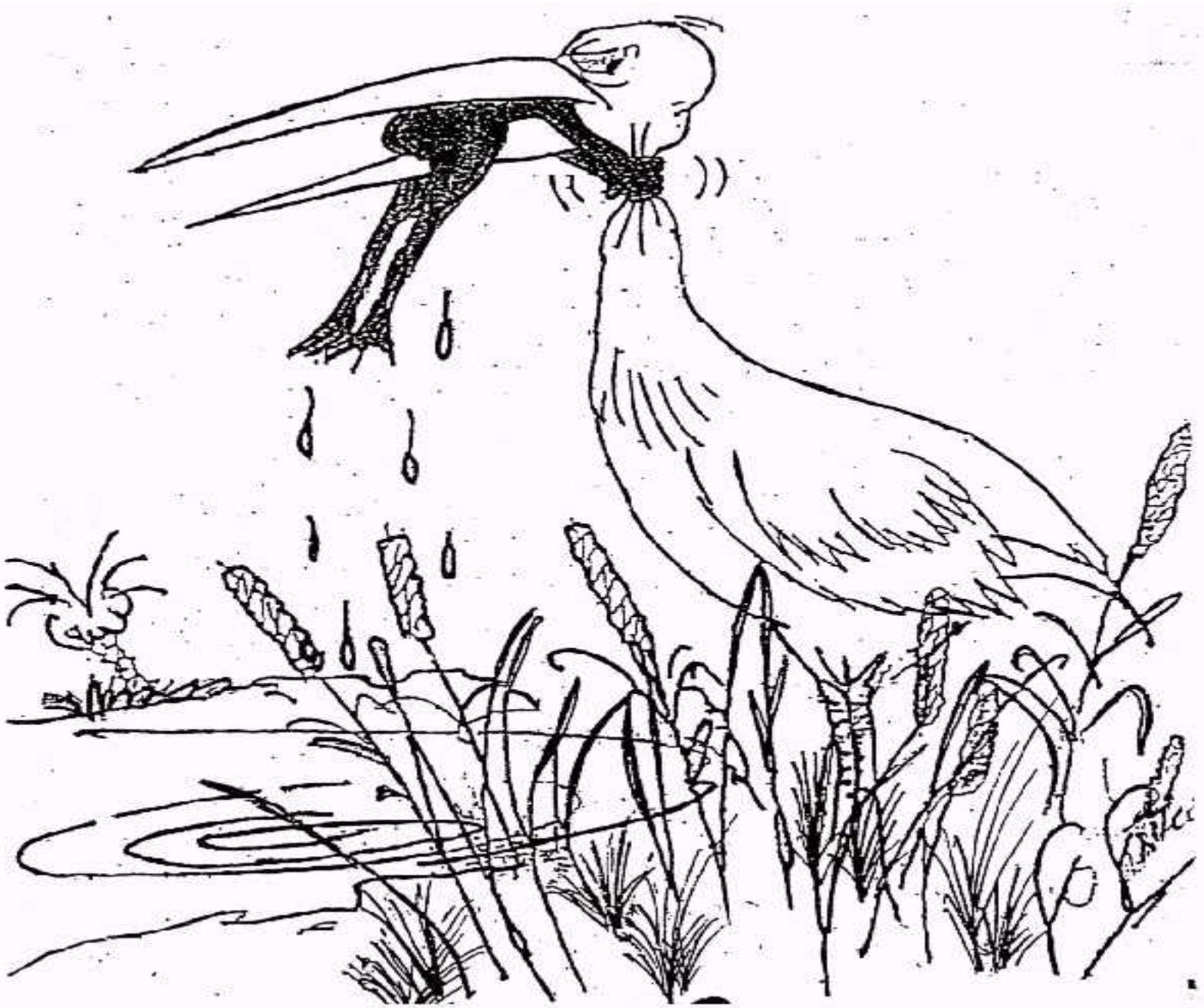


Studies

DoD SERB

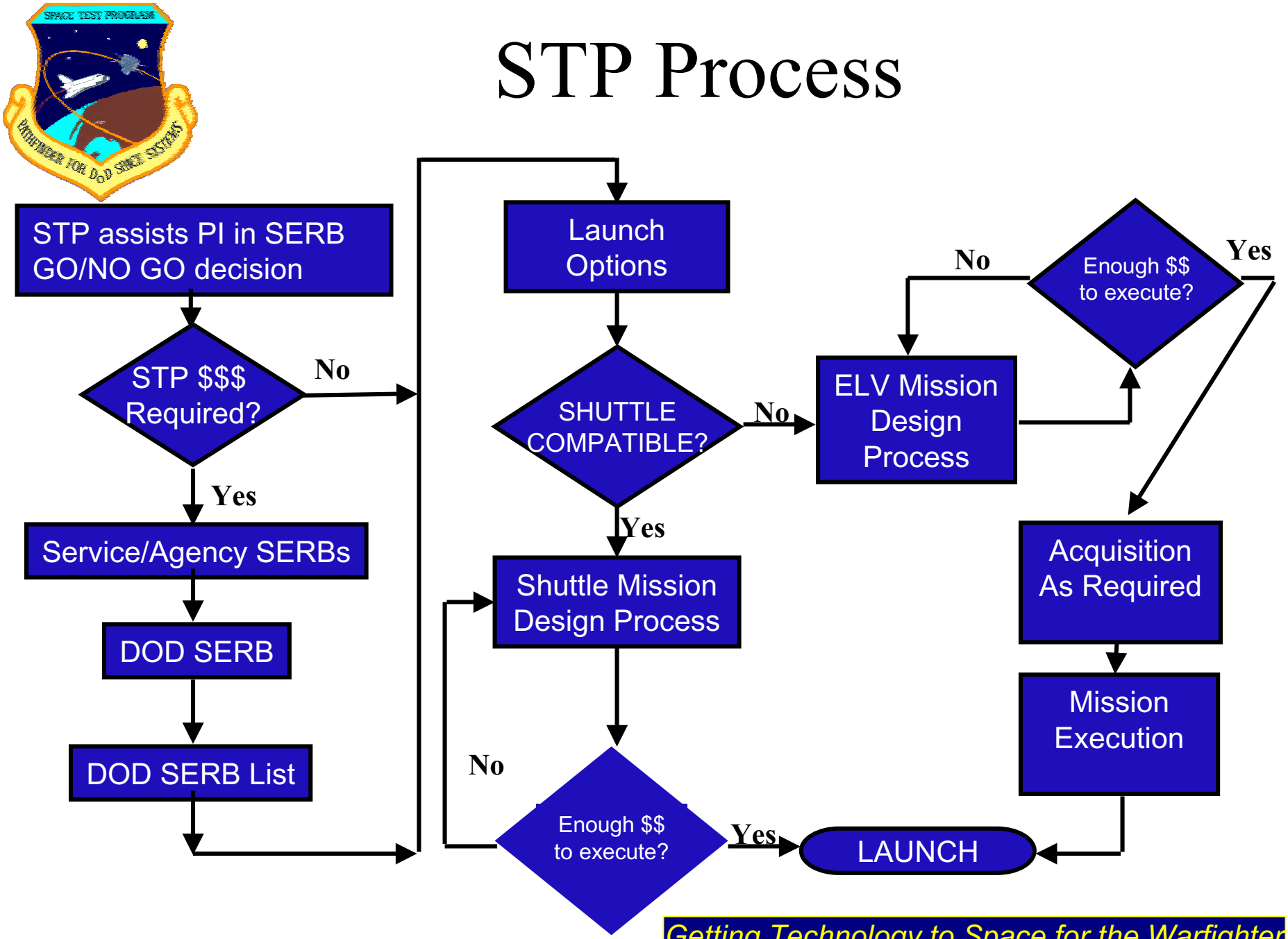


Getting Technology to Space for the Warfighter

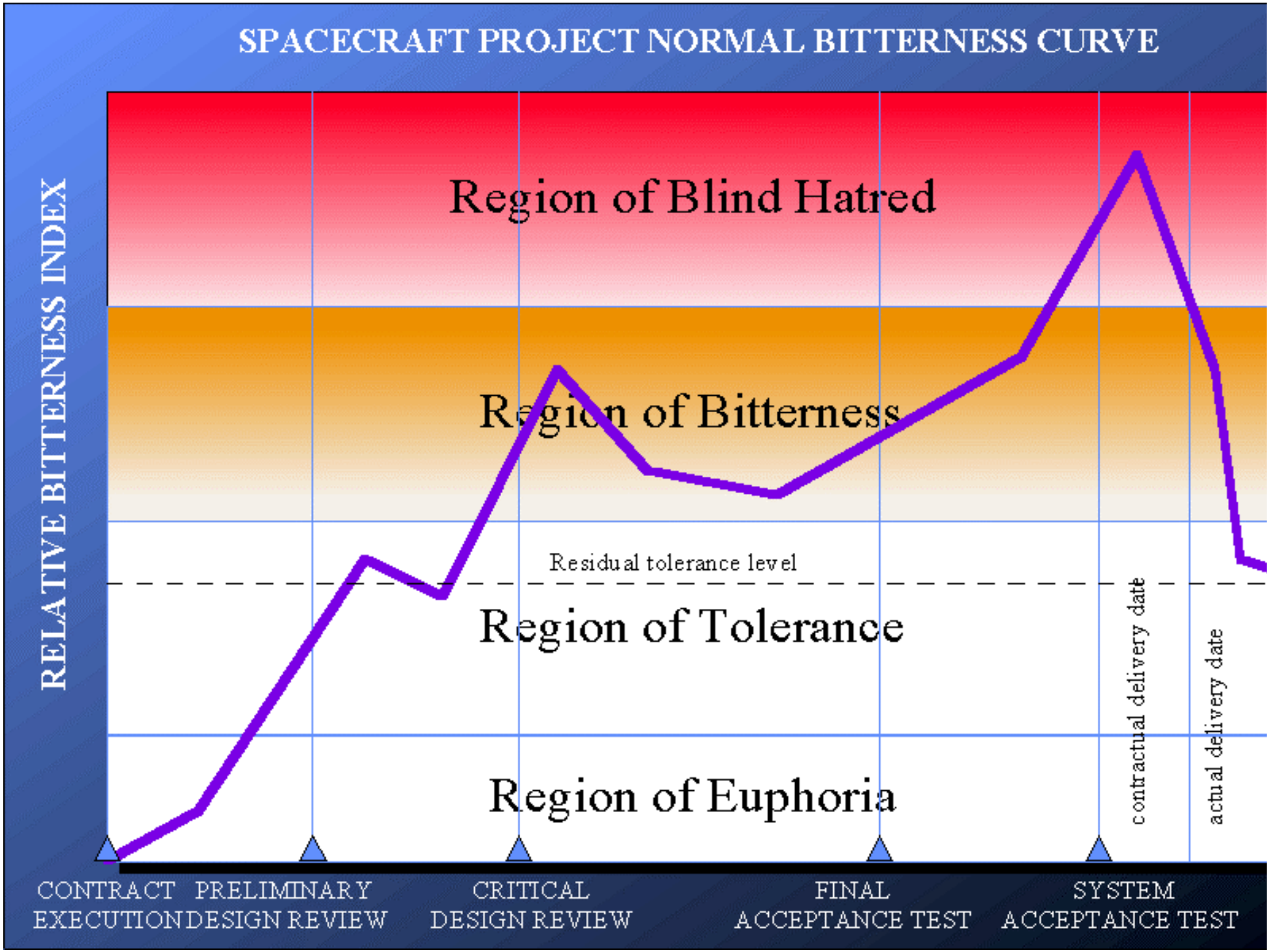


Don't Ever Give Up!

STP Process

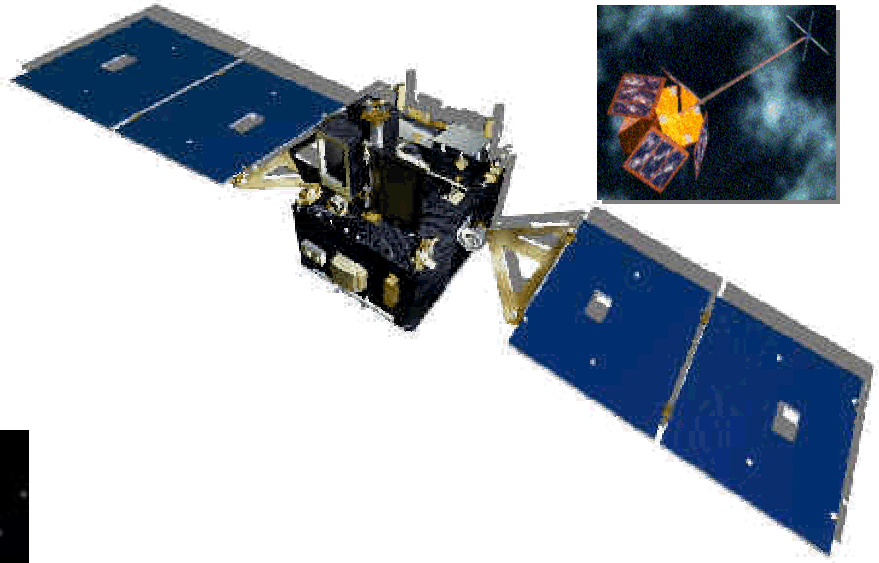


Getting Technology to Space for the Warfighter


SPACECRAFT PROJECT NORMAL BITTERNESS CURVE
RELATIVE BITTERNESS INDEX
Region of Blind Hatred
Region of Bitterness
Residual tolerance level
Region of Tolerance
Region of Euphoria
contractual delivery date
actual delivery date
CONTRACT EXECUTION
PRELIMINARY DESIGN REVIEW
CRITICAL DESIGN REVIEW
FINAL ACCEPTANCE TEST
SYSTEM ACCEPTANCE TEST

- STP Overview
- Current Missions
- Future Activities
- AFSPC Secondaries Policy
- Prospects

Sometimes you don't have to fly a satellite to do space science



Spacecraft for Rent

Getting Technology to Space for the Warfighter

Second image from MightySat II.1, taken 4 Aug 00

Hyperspectral Imaging Proven On Orbit!

Prospect Reservoir

Horse Creek Reservoir dam

Horse Creek Reservoir

Pink areas - healthy vegetation

NS runway

NS runway under construction

EW runway

DIA concourses

Thin cloud / haze

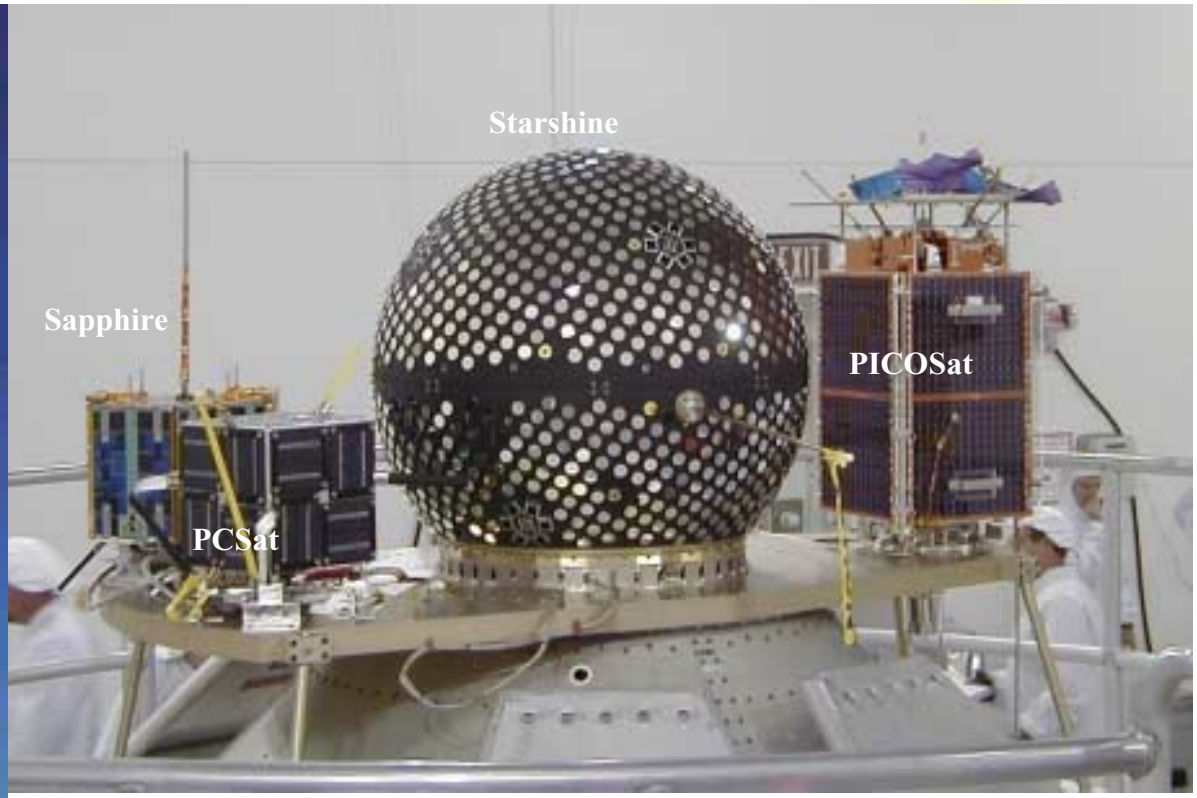
Cloud

Parallel NS runways

This Spacecraft for Rent

Launch
Minotaur II, 19 Jul 00

NASA/STP Kodiak Star PAYLOAD SUITE



6 Experiments on 3 spacecraft

Launched 29 Sep 01, Kodiak, Alaska

Getting Technology to Space for the Warfighter

All spacecraft operating fine!

PCSat

United States Naval Academy

SAPPHIRE

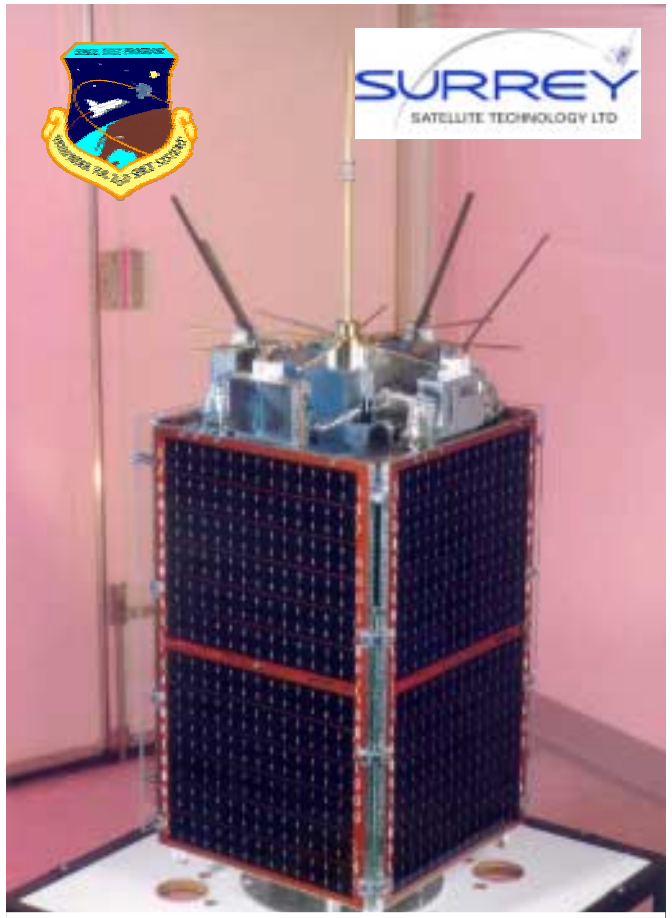
United States Naval Academy

Washington University in St.Louis

STANFORD Aeronautics & Astronautics

SSDL

Space Systems Development Laboratory



SURREY SATELLITE TECHNOLOGY LTD

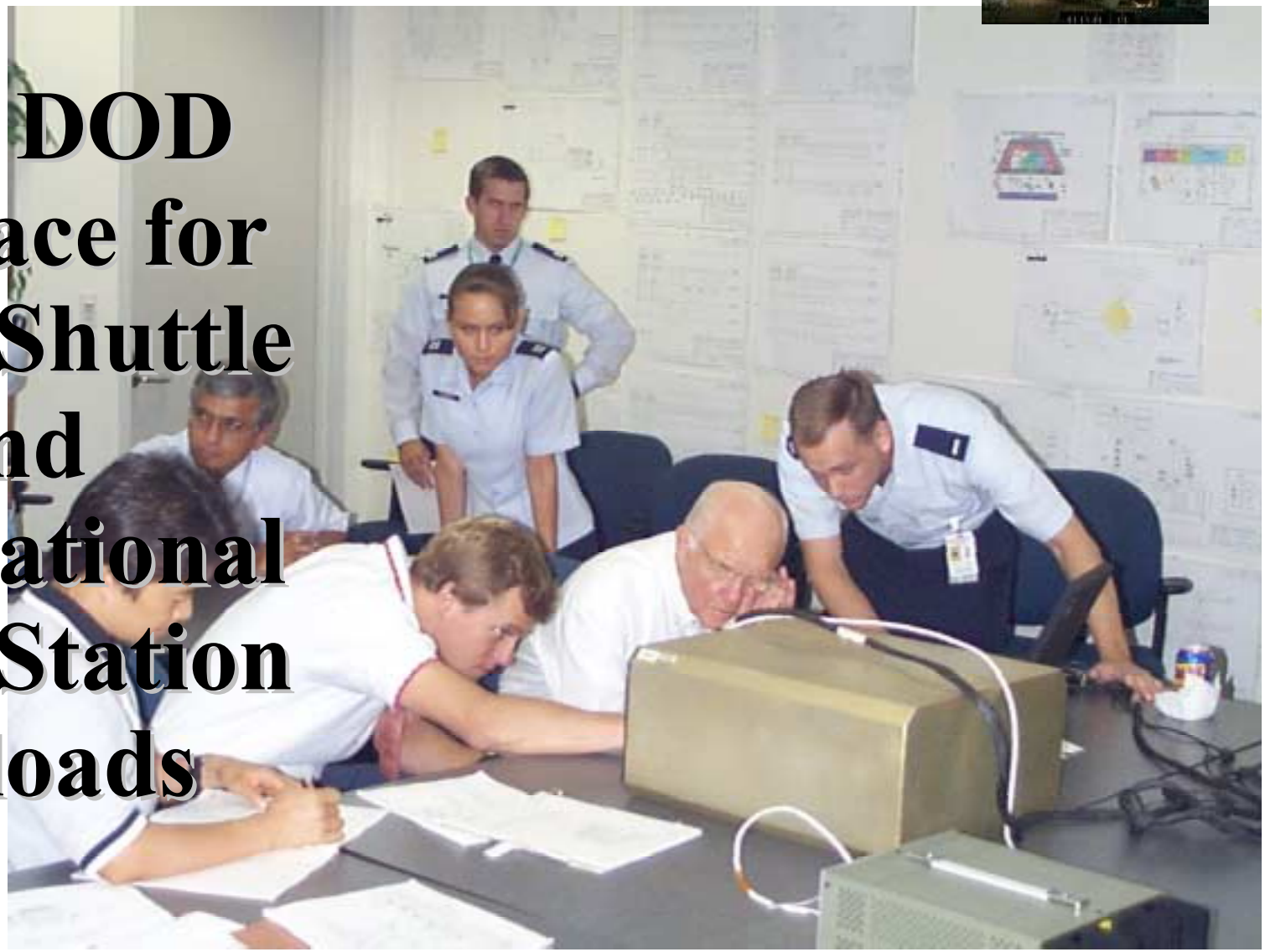
PICOSat

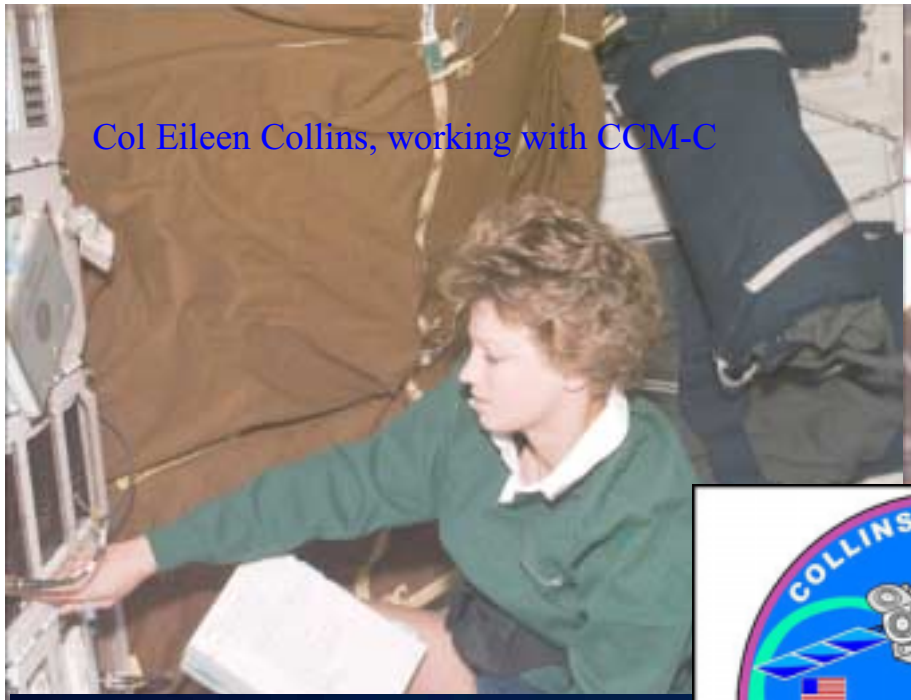
Getting Technology to Space for the Warfighter


LARRY... I'M HERE WITH AN ENGINEER WHO ACTUALLY UNDERSTANDS SPACE SHUTTLE GROUND OPERATIONS

DOD Space Test Program
Shuttle/ISS Office

Single DOD interface for Space Shuttle and International Space Station Payloads





Col Eileen Collins, working with CCM-C

MS2, Steve Hawley, taking a status of MEMS.

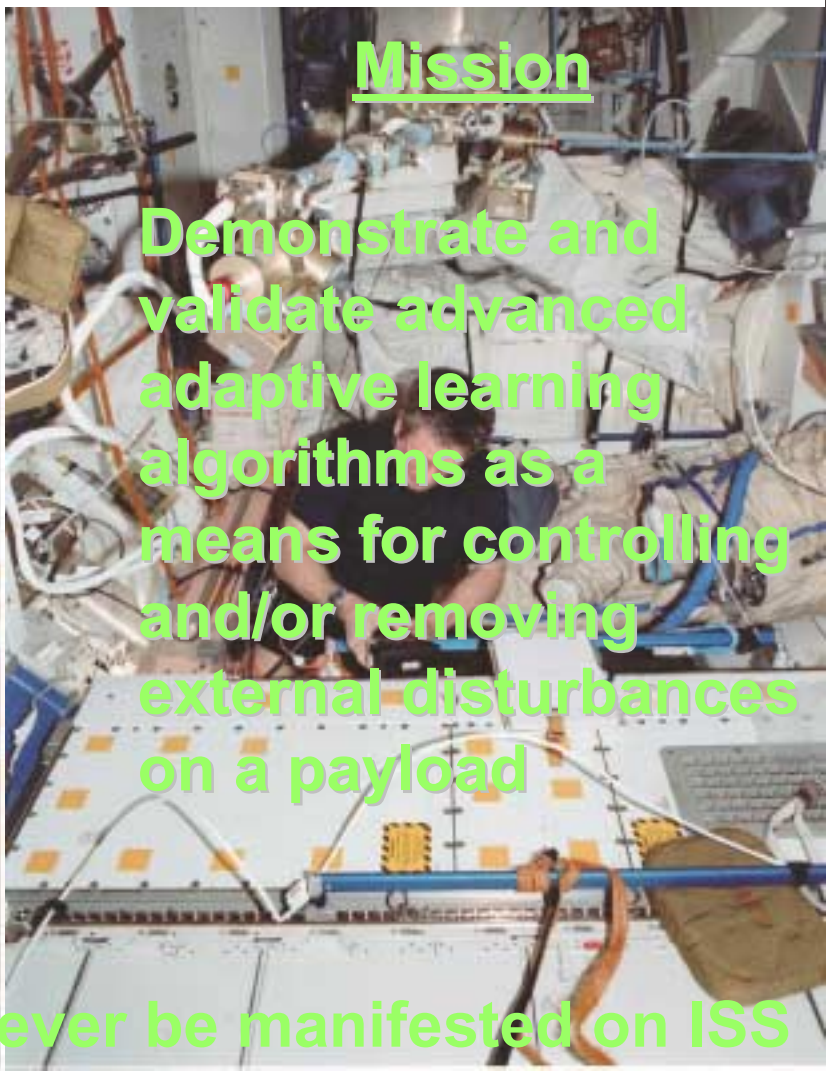
STS-93 Space Test Program Payload Operations

Pilot, Jeff Ashby, working STL-B operations.

S83E5047 1999.09.0105.20:27

MIDDECK ACTIVE CONTROL EXPERIMENT REFLIGHT (MACE-II)

Launch: STS-106 (8 Sep 00)

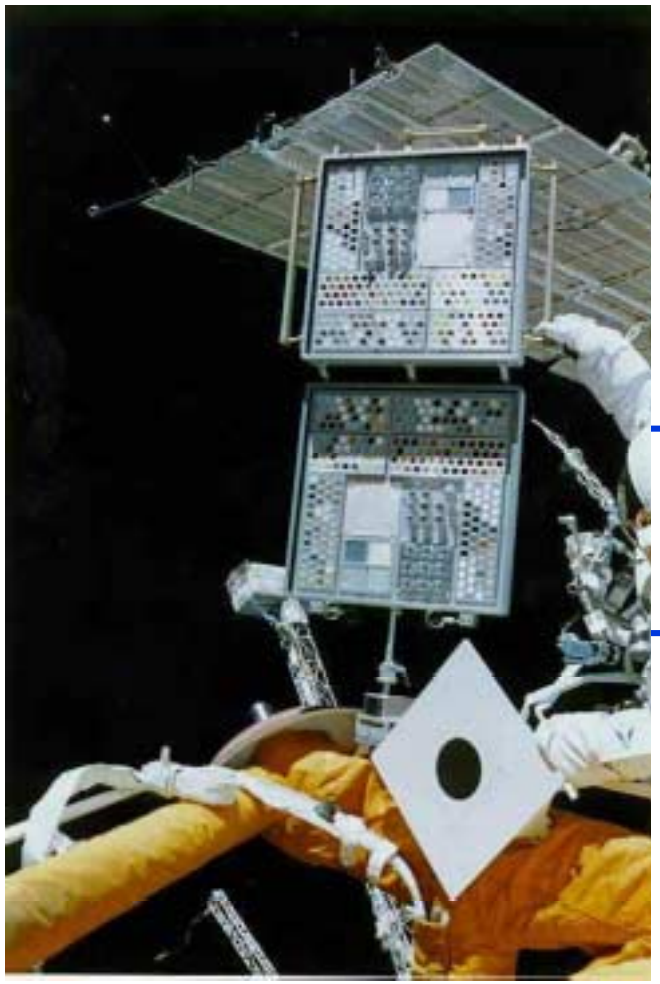


Mission

Demonstrate and validate advanced adaptive learning algorithms as a means for controlling and/or removing external disturbances on a payload

MACE II is the first experiment to ever be manifested on ISS

Materials on the ISS Experiment (MISSE)



The objective of MISSE, which also flew on MIR, is to investigate the effects of the space environment on various materials to be utilized in future spacecraft and space vehicles.
Over 1500 material specimens in 2 separate Passive Experiment Carriers (PECs) will be installed externally.
The PECs are passive and do not require power nor data downlink/uplink.

Launch

Ascent: STS-105 (12 Aug 01) Return: STS-114 (Nov 02)

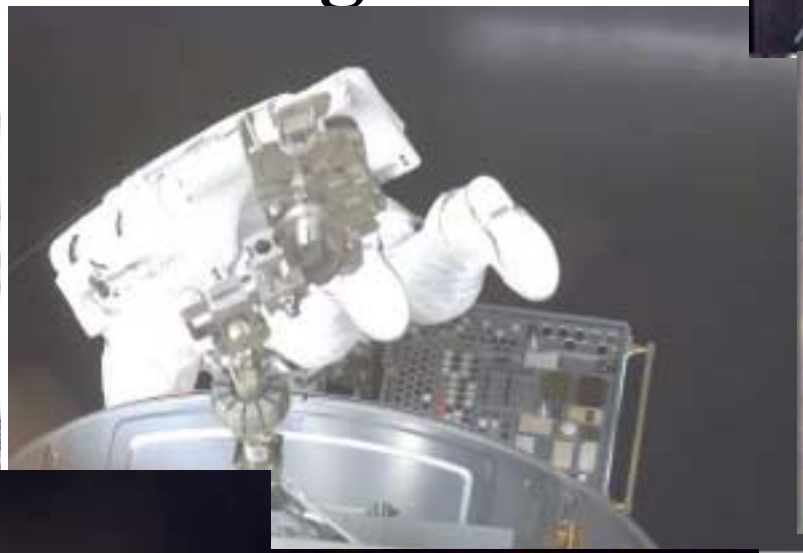
Operations

International Space Station (Monitored by STP Payload Operations Control Center (POCC), Johnson Space Center)

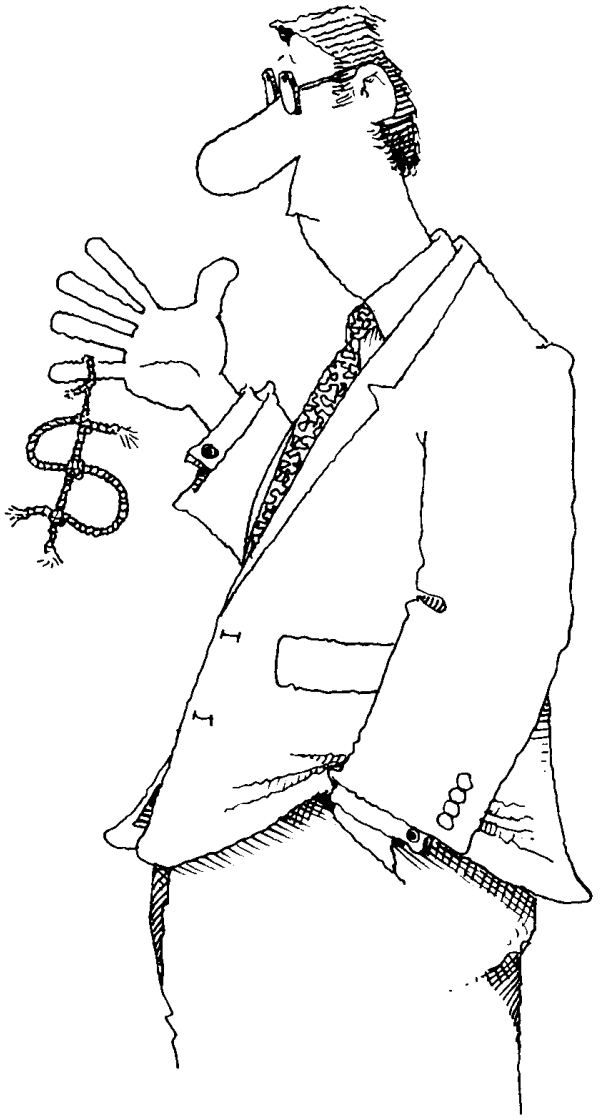
MISSE is the first external experiment on the International Space Station

Getting Technology to Space for the Warfighter

STP's MISSE Experiment Installation on ISS, 16 Aug '01

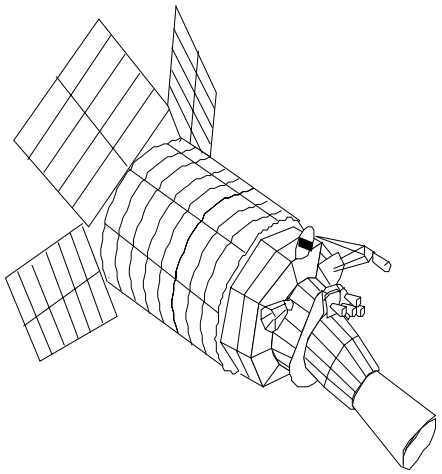


Agenda



- **STP Overview**
- **Current Missions**
- **Future Activities**
- **AFSPC Secondaries**
- **Prospects**

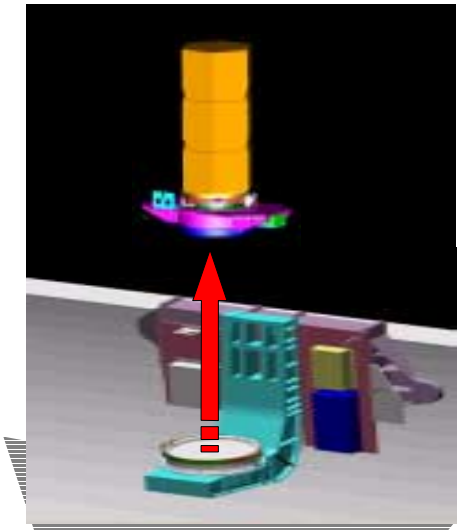
SAVE PIGGYBACK ON DSP

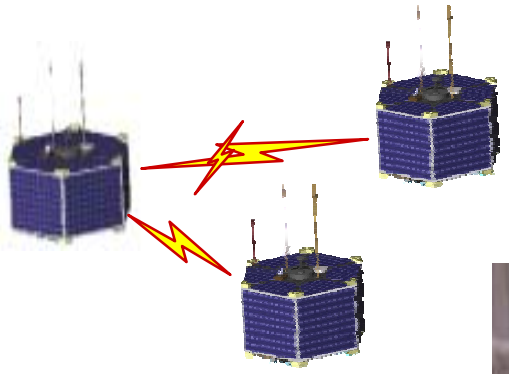


- Space and Atmospheric Burst Reporting System (SABRS) Space Validation Experiment (SAVE)
  - demonstrates a low cost, integrated Nuclear Detonation (NuDet) system.
  - objective is to verify the ability to meet sensitivity requirements with acceptable false alarm rates.

- SAVE is scheduled to fly on Defense Support Program flight 23.

AFRL-904 - NanoSat Constellation

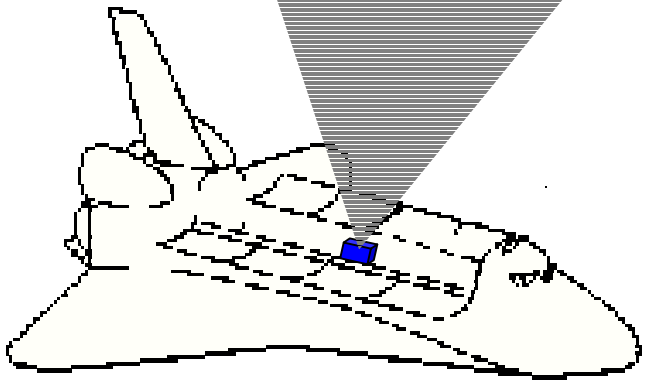


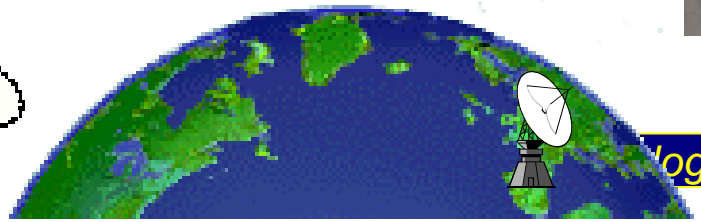


OBJECTIVE

—Demonstrate microsatellite components, separation systems, and formation flying technologies to support DoD microsatellite mission applications

THREE CORNER SAT undergoing Instrumentation prep for Stack Sine-Sweep

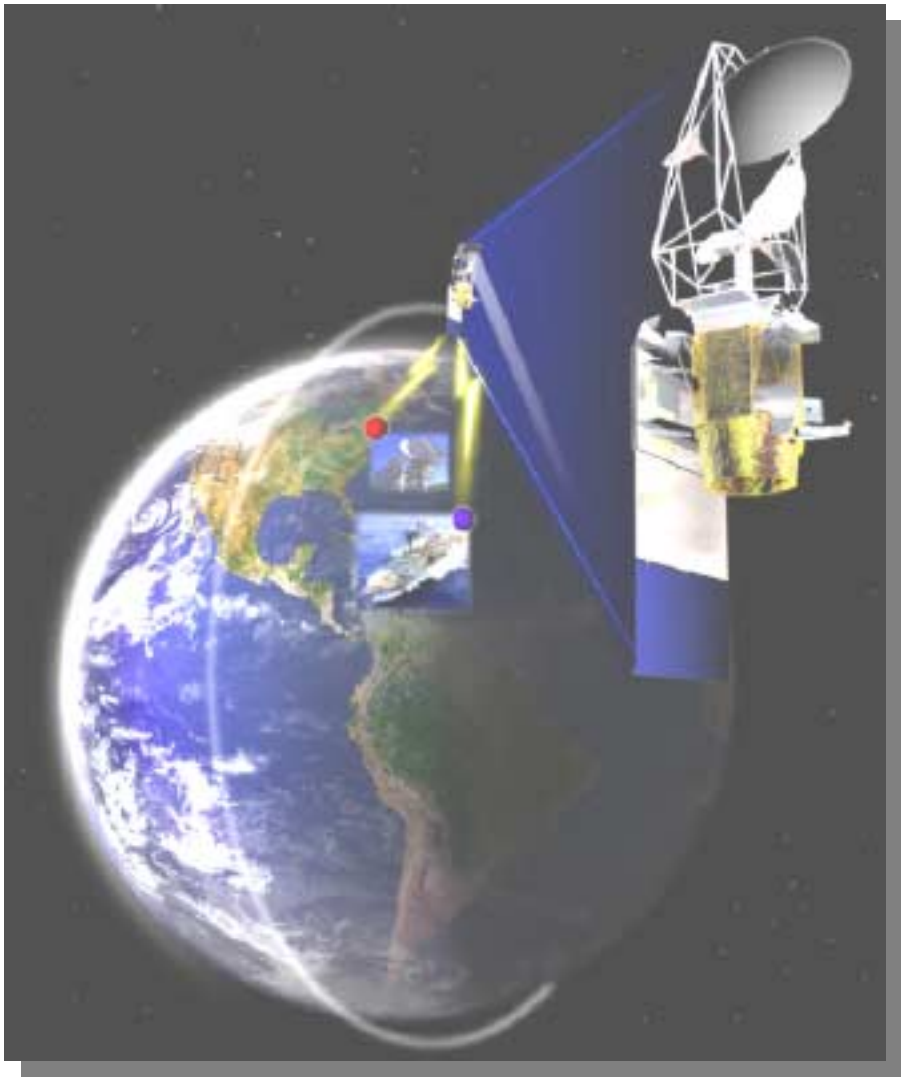




logy to Space for the Warfighter

Coriolis (P98-2)

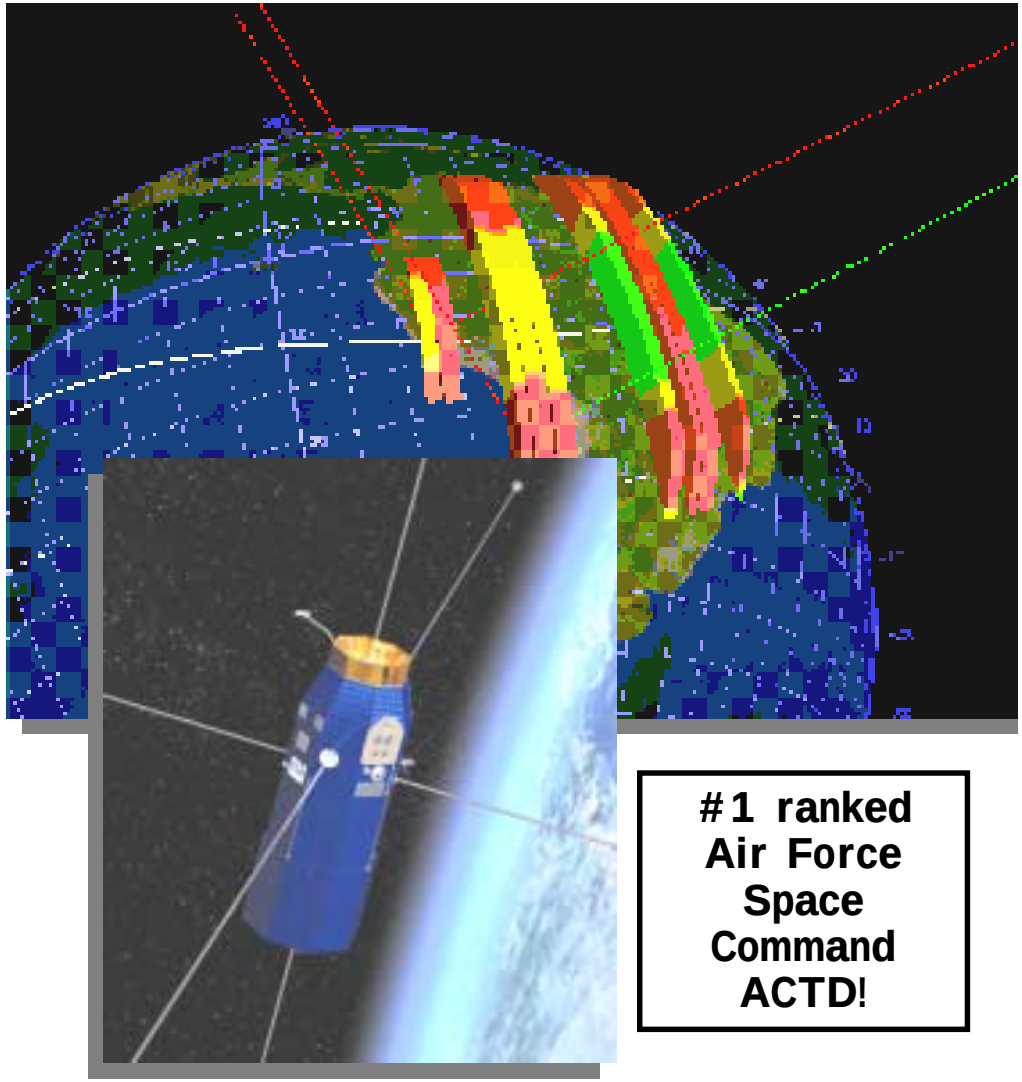
- Supports risk reduction flight test of NPOESS environmental sensor and demonstrates a solar activity monitor which can provide warning of impending solar storms
- Launch: Titan II, Aug 02



C/NOFS (P00-3)

Comm/Nav Outage Forecast System

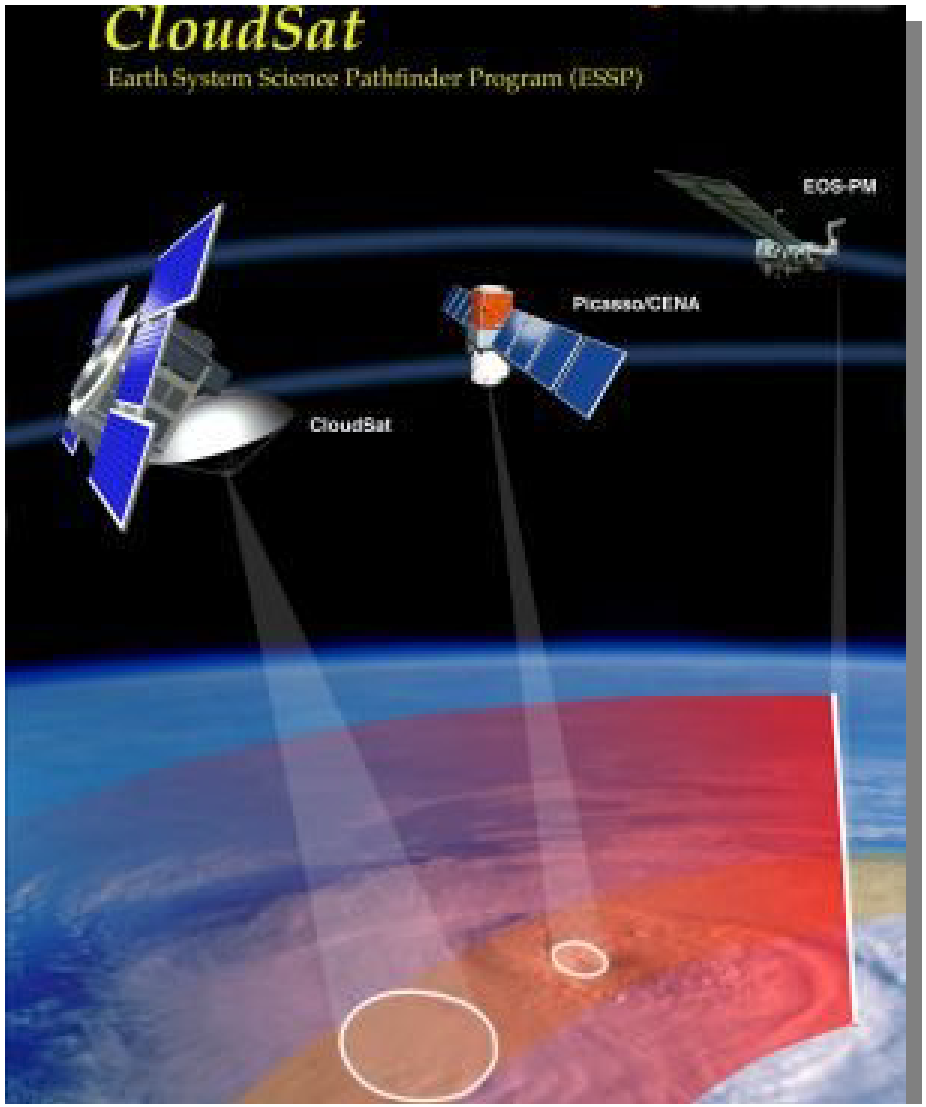
- **Demonstrates prediction of communication/ navigation outages in equatorial latitudes due to ionospheric conditions.**
- **Launch: Pegasus ILC Dec '03**



#1 ranked Air Force Space Command ACTD!

Getting Technology to Space for the Warfighter

CloudSat (S98-C)



- **CloudSat (SMC-801)--Cloud and Aerosol Vertical Profiler.**
  - **Profile vertical structure of clouds and aerosols and their properties along satellite nadir track.**
  - **On board instruments include an optical imager, near-IR spectrometer, and a milli-meter wave radar**
  - **Will co-manifest and formation fly with PICASSO-CENA lidar.**

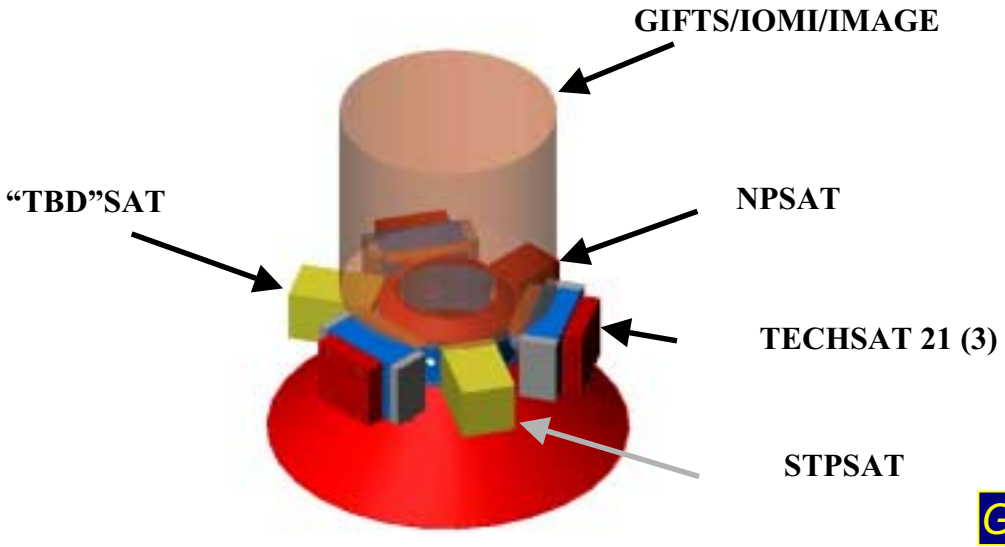
JPL asked STP to fly for them!

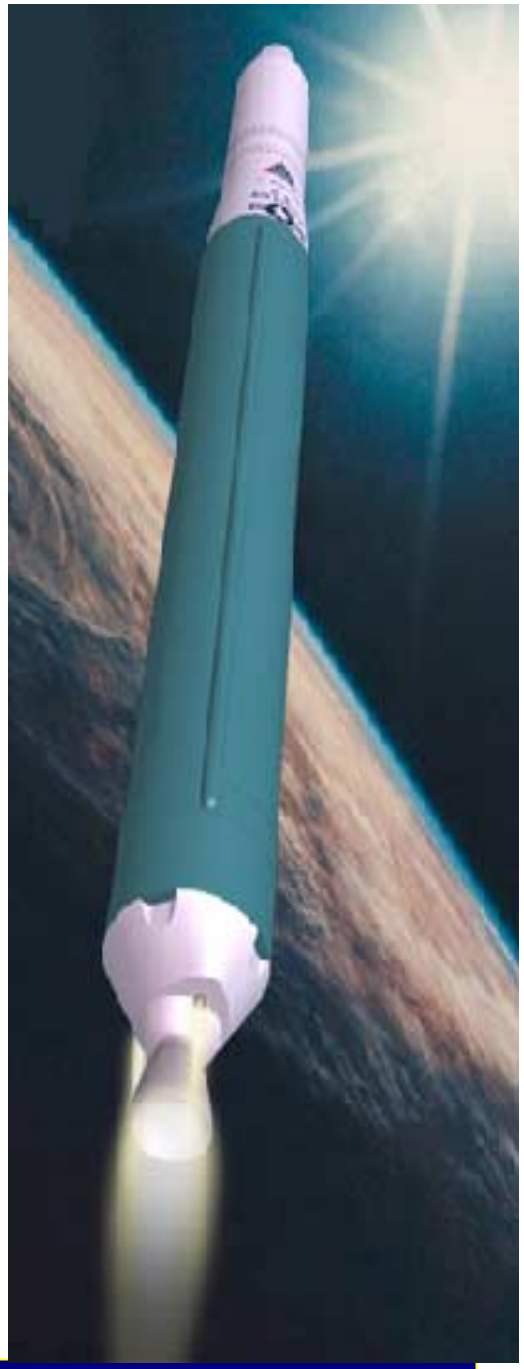
Getting Technology to Space for the Warfighter

MEDIUM LAUNCH VEHICLE 2005

Manifest

- Primary Spacecraft
  - IOMI/GIFTS/IMAGE
- EELV Secondary Payload Adapter with 5 Spacecraft
  - TechSat-21 is allocated three slots
  - STPSat-1 is allocated one slot
  - NPSat1 is allocated one slot
  - One slot held in reserve





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AFSPC/DO Secondaries Policy

- **Policy identifies STP as the "front door" to implement the interim policy**
  - **Inquiries into use of AFSPC excess capacity routed to STP**
- **Interim policy for "piggybacks" on AFSPC satellites requires**
  - **STP coordinates/facilitates process with customer and SPOs**
    - **Technical approval (can it be done) from both LV and SV SPOs**
    - **Operational approval (should it be done) from AFSPC/DO**
    - **AFSPC/DO coordinates/directs with 14AF/A3, AFSPC/DR/SE, & J33**
  - **Final approval granted by AFSPC/DO**

AFSPC/DO Policy: Secondaries on AFSPC LVs

- **Interim Policy for "secondaries" on AFSPC launch vehicles requires**
  - **STP coordinates/facilitates process with customer and SPO**
    - **Technical approval (can it be done) from LV SPOs**
    - **Operational approval (should it be done) from AFSPC/DO**
    - **AFSPC/DO coordinates/directs with 14AF/A3, AFSPC/DR/SE, & J33**
  - **Final approval granted by AFSPC/DO**
- **Policy requires STP to provide quarterly updates on DoD experiments that fly on NASA missions 36 months out**
- **Policy identifies AFSPC/DO as the arbiter of disputes between agencies**

- STP Overview
- Impact of Past Missions
- Current Missions
- Future Activities
- AFSPC Secondaries Policy
- Prospects

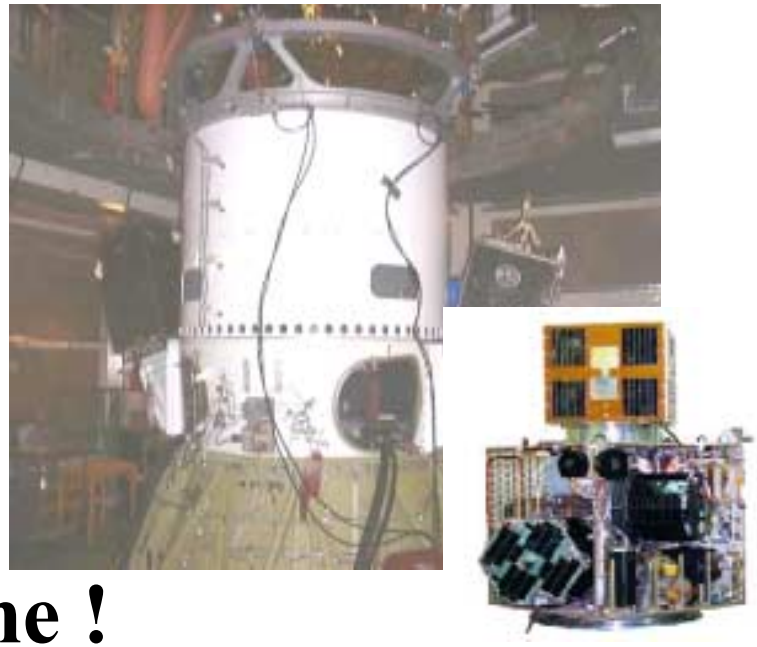
Getting Technology to Space for the Warfighter

What is "Affordable Access to Space"?

- Current "cost per pound"
  - $9k-$27k
  - You don't buy it by the pound
    - Buy a Booster
  - May have unused lift capacity
- Why do they cost so much?
  - Physics (0-17,000 mph)
  - Mission Assurance

Can we use any excess capacity?

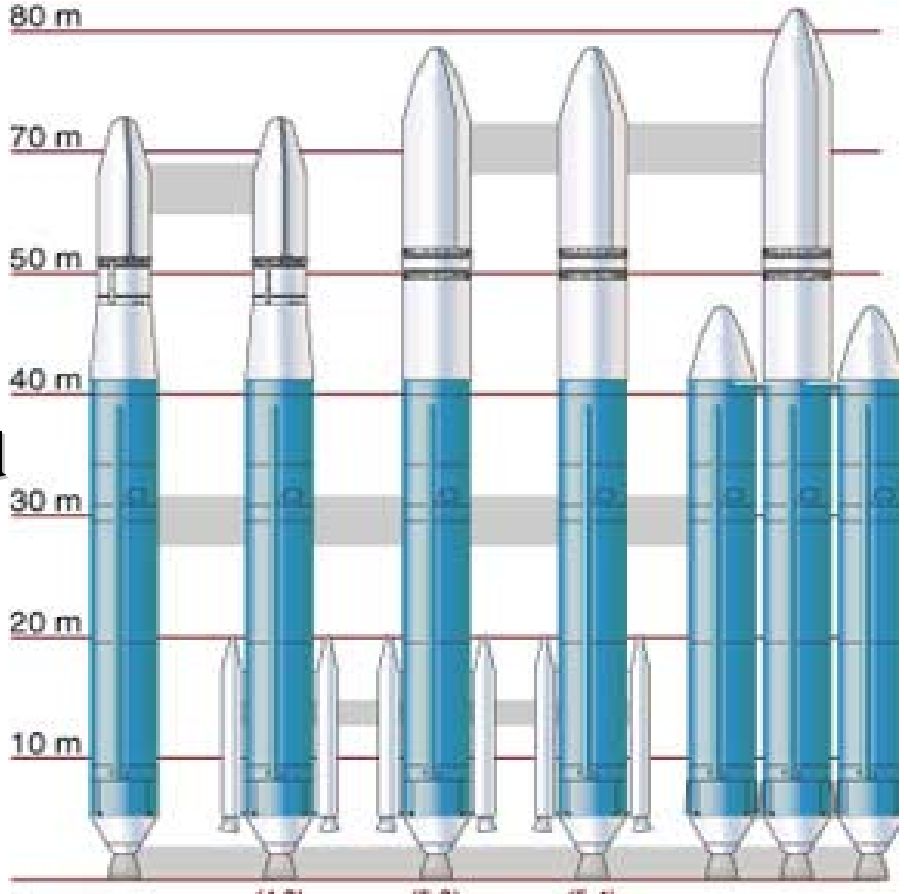
- **Current capability**
  - **Delta II…it's hard**
  - **Titan/Atlas…no**
  - **Small Launch Vehicles…yes**
    - **Minotaur, Pegasus, Athena**
- **But Ariane does it all the time !**



But I can't use Ariane @#$%!

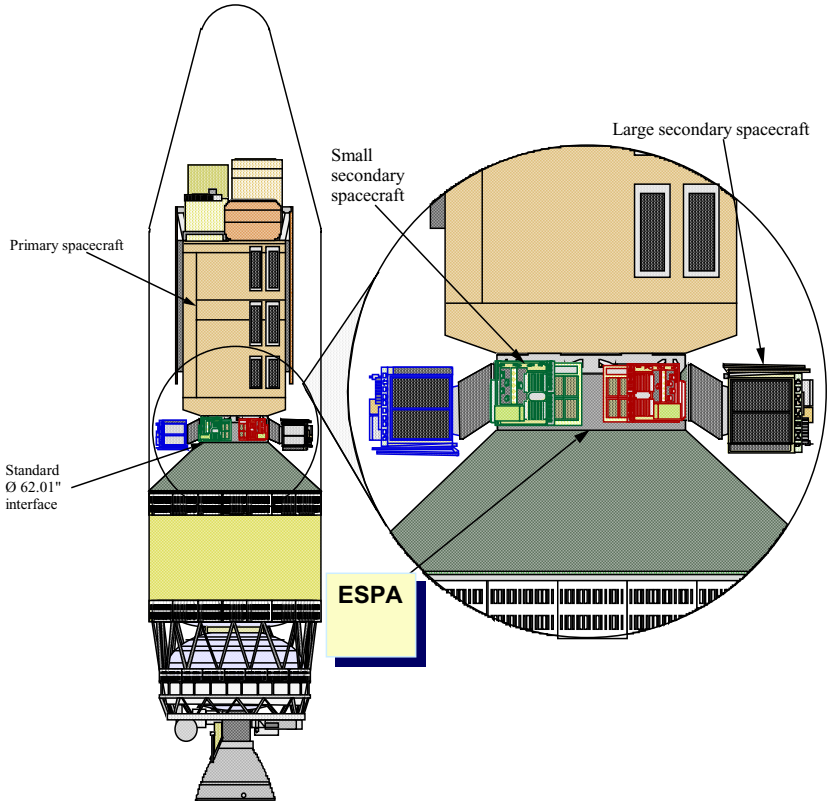
U.S. New Launcher - Evolved Expendable Launch Vehicle

- Lots of capacity, no current way to use excess
  - – STP/AFRL saw an opportunity
- "Ariane like" Secondary Payload Adapter
  - –use excess capacity
  - –larger volume than ASAP
  - –possible larger mass than ASAP
  - –up to 6 secondary satellites



EELV Secondary Payload Adapter - ESPA

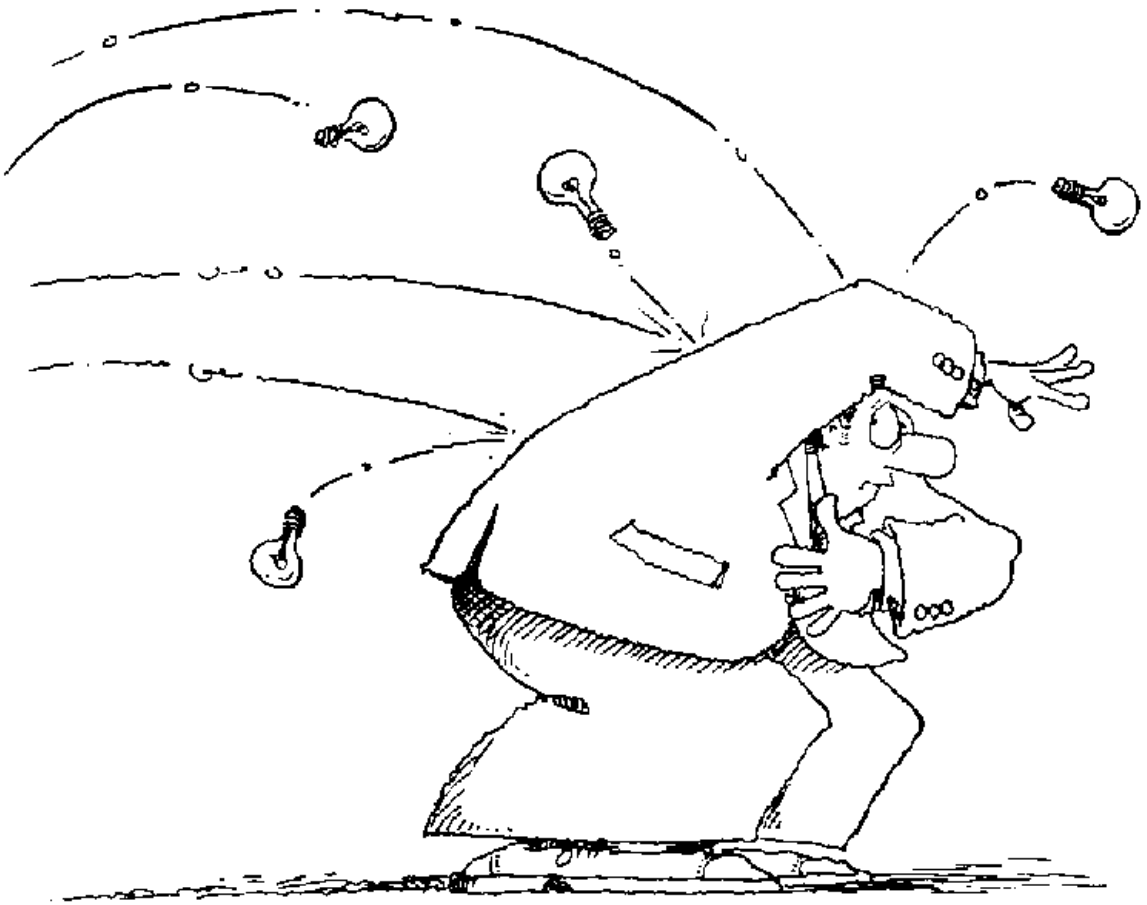
- **ESPA will be the US's first "normalized" secondary payload capability**
  - **fits any EELV-M**
  - **prime payload interface the same**
- **STP building a new national capability**
  - **"out of hide", but expect entire space community to benefit**
- **First Flight in late CY 05**
  - **schedule driven by STP's EELV-M and $**

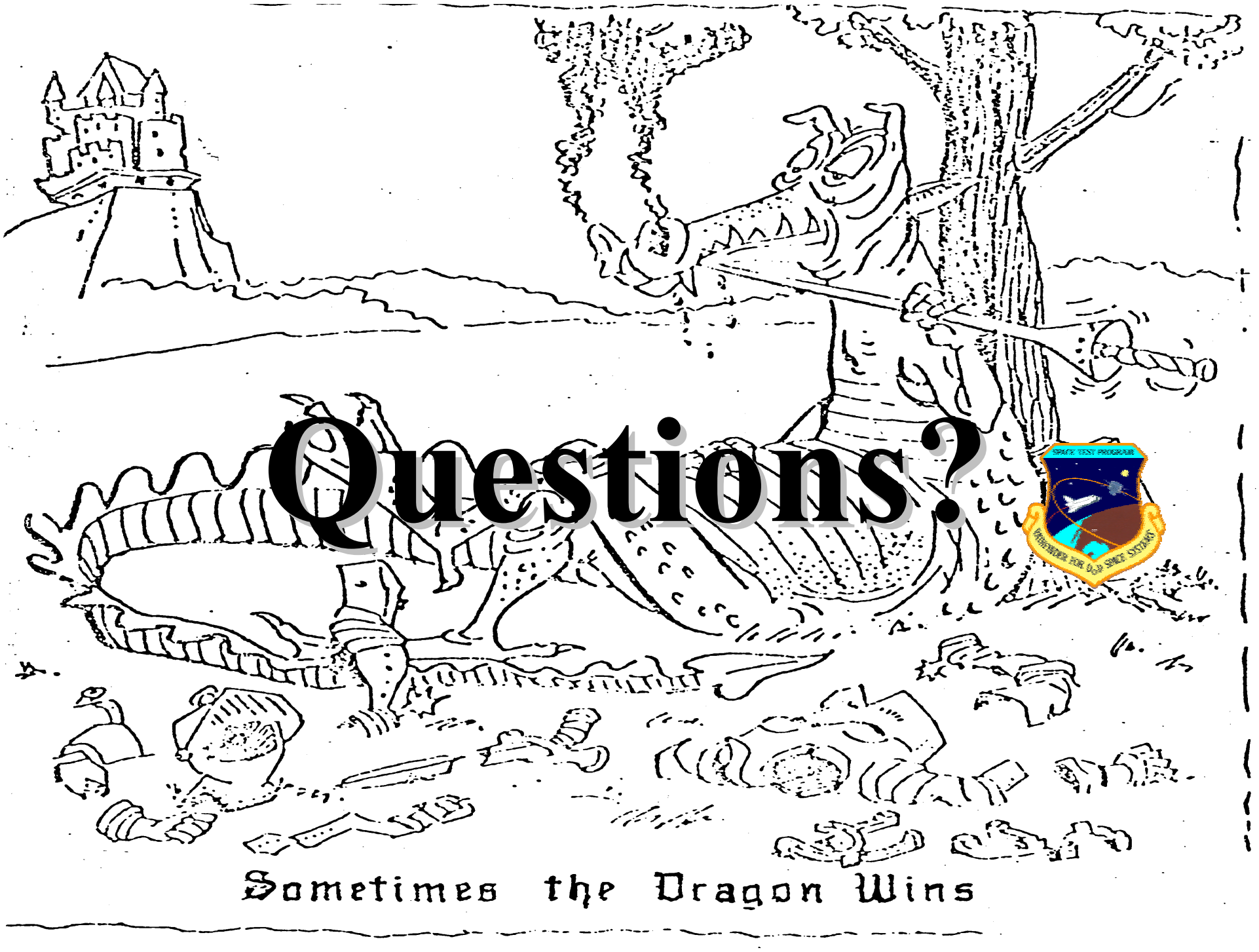



"BUT WHAT ABOUT FUNDING"

STP's "dope deal" with the Military Academies

- **Basically, STP has committed to the AFA and USNA that if they build a satellite around a SERB experiment we will launch it.**
- **Is this something Universities might pursue with NASA via Space Grant?**




Questions?
Sometimes the Dragon Wins